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An Alternative Progenitor Scenario for the Most Iron-poor CEMP-no Stars.

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Understanding the nature of the first stars is essential to decipher the chemical abundance patterns in the most iron-poor CEMP stars. Due to their zero-metallicity nature, Pop III stars were structurally quite different than stars of higher metallicity. Namely, interactions between H- and He-burning layers have been recorded in the literature for both rotating and non-rotating stellar models. We recently showed that the intermediate neutron capture process (i-process; Nn=10ˆ13-16 cmˆ-1) can explain the lack of an odd-even effect in two of the most iron-poor CEMP-no stars, HE 0107-5240 and HE 1327-2326. We present results from a recent survey of Pop III stellar models where we investigated the occurrence and behaviour of interactions between H and He-layers. Simulations of massive Pop III stars from 15-140M_sun with various mixing prescriptions show that some form of interaction is present in 22/26 of our simulations. These interactions can vary in nature and result maximum H-burning luminosities from logL_H/L_sun ˜9-14. Higher luminosities typically coincide with energy generation around 25% of the binding energy of the H-He layer and could potentially expel a portion of the material enriched with i-process signatures. Motivated by the results seen in 1D simulations, we have calculated 3D hydrodynamic simulations of the events which shed new light on the mixing processes involved in the interiors of the first stars.

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